
Stamp Goes Here

Student Notes

Science on Saturday

February 18, 2012

Space Junk: Traffic Cops in Space

Presenters:

Dr. John Henderson, Lawrence Livermore National Laboratory
Mr. Tom Shefler, Granada High School, Livermore

Goal

Our society is reliant on satellites for many important everyday activities: travel, farming, communications, and entertainment are a few examples. As we launch more satellites, the risk of a satellite colliding with another satellite or a piece of space junk increases, threatening those satellite services we depend on. This presentation will review the many ways we use satellites, how space collisions happen, how much of a danger space collisions are, and what can be done to prevent space collisions. Along the way, we will see that collisions in space have surprising results because of the extremely high collision speeds, we will learn why most satellites simply cannot maneuver out of the way of space junk, and why supercomputers are part of the solution to minimizing collisions. Surprisingly, launching additional satellites can help reduce the problem by providing better information on the location of space objects.

Today you will learn

- What is space junk.
- Why we care about space junk.
- Everyday uses of satellites.
- How to gauge the accuracy of a weather forecast.
- How speed affects space collisions.
- What the best time is to observe meteor showers.
- How to avoid space collisions.

Student Lecture Notes

1. Space debris is defined as “uncontrolled objects in orbit bigger than” what size?
2. What were the names of the two satellites that collided in 2009?
3. Name three ways people use satellites every day.
4. How can you tell if a long-term weather forecast will be accurate?
5. How fast, in km/s, are typical space collisions?
6. More satellites are in _____ than any other type of orbit.
 - a. Low Earth Orbit
 - b. Medium Earth Orbit
 - c. Geo-synchronous Orbit
 - d. Highly Elliptical Orbit
7. About 50% of the mass that is currently in low Earth orbit can be accounted for in what single object?
8. What time of day is best to observe meteor showers?
9. List two reasons why satellites aren't usually moved even after a warning of potential collision.

Presenters

John Henderson

Lawrence Livermore National Laboratory



John Henderson is a remote sensing scientist at Lawrence Livermore National Laboratory. He leads the Space Systems Group in the Global Security Directorate. John has worked on weather satellites, nano-satellites, ion accelerators, and a cloud LIDAR. His publications and research interests include low-temperature solid state physics, atomic physics, optical remote sensing, laser communication, remote sensing for treaty verification, and technologies for space situational awareness. He collaborates with the CTBT Organization on treaty work, and the Naval PostGraduate School, Air Force Research Laboratory and other DOE labs on the space situational awareness work. He has a B.S. in Engineering Physics from the Colorado School of Mines, and a M.S. and Ph.D. in Physics from Stanford University.

Tom Shefler

Granada High School, Livermore School District



Tom Shefler received a Bachelor of Science degree in physics and applied mathematics from Western Michigan University in 1997 and a Master of Arts degree in astronomy and astrophysics from the University of California at Berkeley in 2000. While at Berkeley, he researched analyzed and cataloged Hubble Space Telescope images of galaxies, observational research involved in the detection and study of extrasolar planets, and discovered Supernova 1998DT while working with the Katzman Automatic Imaging Telescope team. During his graduate studies he fell in love with teaching and entered the teaching profession in 2000.

Program Feedback

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Instructions: Please fill in the circle that corresponds to your rating.

Not at all	A little	Somewhat	A fair amount	A great deal
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1. To what degree would you be interested in learning more about this topic? ☐ ☐ ☐ ☐ ☐
2. To what degree did you understand this talk? ☐ ☐ ☐ ☐ ☐

CIRCLE the response that best describes you.

My grade level is (1) K-5 (2) 6-8 (3) 9-12 (4) College (5) Parent/Teacher

My school district is (1) Livermore (2) Pleasanton (3) San Ramon (4) Tracy (5) Dublin (6) Other _____

Do you receive extra credit for attendance at SOS? (1) Yes (2) No

Would you attend if you did not receive extra credit? (1) Yes (2) No

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